IN THE CLAIMS:

1. (Currently Amended) A wavelength division multiplexer/demultiplexer comprising:

a first sub-waveguide having a width that gradually increases in a progressing direction of an optical signal such that, starting at an input of the sub-waveguide and with the gradual increase, tapering of the sub-waveguide is directed inwardly in a concave manner; and

a second sub-waveguide, continuously joined to the first sub-waveguide, having a width that gradually decreases in the progressing direction of the optical signal passing through the first sub-waveguide.

2. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 1, further including a grating for demultiplexing a multiplexed optical signal to single-channel optical signals, an input waveguide for inputting the optical signal to the grating, and output waveguides for outputting the optical signals demultiplexed by the grating.

3. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 1, wherein the first sub-waveguide has a parabolic horn shape.

4. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 1, wherein the second sub-waveguide has a predetermined shape having a width that linearly decreases in the progressing direction of the optical signal passing through the first sub-waveguide.

5. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 1, wherein the second sub-waveguide has a parabolic horn shape having a width that gradually decreases in the progressing direction of the optical signal passing through the first sub-waveguide.

6. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 1, wherein a shape of the first sub-waveguide is defined by the following equation:

$$W_1 = (2\alpha\lambda_g z_1 + W_{i1}^2)^{1/2}, \alpha = -\frac{8\pi\gamma}{3}$$

wherein, z_1 denotes a distance from an input terminal of the first sub-waveguide to a position of a progressing optical signal, W_1 is a width of the first sub-waveguide at the position of the progressing optical signal, W_{i1} is a width of the first sub-waveguide at the input terminal, λ_g denotes an effective wavelength of the optical signal, and γ denotes a

coupling coefficient of the fundamental and higher modes of the optical signal.

7. (Currently Amended) <u>A wavelength division multiplexer/demultiplexer</u>
<u>comprising:</u>

<u>a first sub-waveguide having a width that gradually increases in a progressing</u>
<u>direction of an optical signal ; and</u>

<u>a second sub-waveguide having a width that gradually decreases in the progressing</u>
<u>direction of the optical signal passing through the first sub-waveguide</u>~~The wavelength~~
~~division multiplexer/demultiplexer as set forth in claim 1~~, wherein a shape of the second
sub-waveguide is defined by the Equation 9,

$$W_2 = (W_{i2}^2 - 2\alpha\lambda_g z_2)^{1/2}, \alpha = -\frac{8\pi\gamma}{3}$$
[Equation 9]

wherein, z_2 denotes a distance from the end of the first sub-waveguide to a position of a

progressing optical signal, W_2 is a width of the second sub-waveguide at the position of

the progressing optical signal, W_{i2} is a width of the second sub-waveguide at the contact

point of the first and second sub-waveguides, λ_g denotes an effective wavelength of the

optical signal, and γ denotes a coupling coefficient of the fundamental and higher modes

of the optical signal.

8. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 1, wherein a shape of the second sub-waveguide is defined by the following equation:

$$W_2 = \gamma[1 - \exp(\frac{-z_2}{\alpha})] + W_{i2}, \alpha = -\frac{8\pi\gamma}{3}$$

wherein, z_2 denotes a distance from the end of the first sub-waveguide to a position of a progressing optical signal, W_2 is a width of the second sub-waveguide at the position of the progressing optical signal, W_{i2} is a width of the second sub-waveguide at the contact point of the first and second sub-waveguides, and γ denotes a coupling coefficient of the fundamental and higher modes of the optical signal.

9. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 1, wherein a shape of the second sub-waveguide is defined by the following equation:

$$W_2 = 2\alpha z_2 + W_{i2}, \alpha = -\frac{8\pi\gamma}{3}$$

wherein, z_2 denotes a distance from the end of the first sub-waveguide to a position of a progressing optical signal, W_2 is a width of the second sub-waveguide at the position of the progressing optical signal, W_{i2} is a width of the second sub-

waveguide at the contact point of the first and second sub-waveguides, and γ denotes a

coupling coefficient of the fundamental and higher modes of the optical signal.

10. (Currently Amended) A wavelength division multiplexer/demultiplexer for

use in a planar lightwave circuit (PLC) having an arrayed waveguide grating including a

plurality of optical waveguides, an input waveguide for inputting a multiplexed optical

signal to the grating, and output waveguides for outputting single-channel optical signals

demultiplexed by the grating, the wavelength division multiplexer/demultiplexer

comprising:

an input waveguide having,

a first sub-waveguide, ~~in which its~~whose width gradually increases in a

progressing direction of the optical signal such that, starting at an input of the

sub-waveguide and with the gradual increase, tapering of the sub-waveguide is

directed inwardly in a concave manner; and

a second sub-waveguide, continuously joined to the first sub-waveguide,

~~in which its~~whose width gradually decreases in the progressing direction of the

optical signal passing through the first sub-waveguide.

11. (Original) The wavelength division multiplexer/demultiplexer as set forth in

claim 10, wherein the first sub-waveguide has a parabolic horn shape.

12. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 10, wherein the second sub-waveguide has a predetermined shape having a width that linearly decreases in the progressing direction of the optical signal passing through the first sub-waveguide.

13. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 10, wherein the second sub-waveguide has a parabolic horn shape having a width that gradually decreases in the progressing direction of the optical signal passing through the first sub-waveguide.

14. (Original) The wavelength division multiplexer/demultiplexer as set forth in claim 10, wherein the input waveguide, comprising the first and second sub-waveguides, is respectively disposed on both sides of the substrate centering on the arrayed waveguide grating, and the output waveguides arranged in parallel with the input waveguide are respectively disposed on both sides of the substrate centering on the arrayed waveguide grating.